

July 4, 1944.

H. P. HOPP ET AL

2,353,035

CHAIN LADDER

Filed April 3, 1943

4 Sheets-Sheet 1

FIG. 1.

FIG. 2.

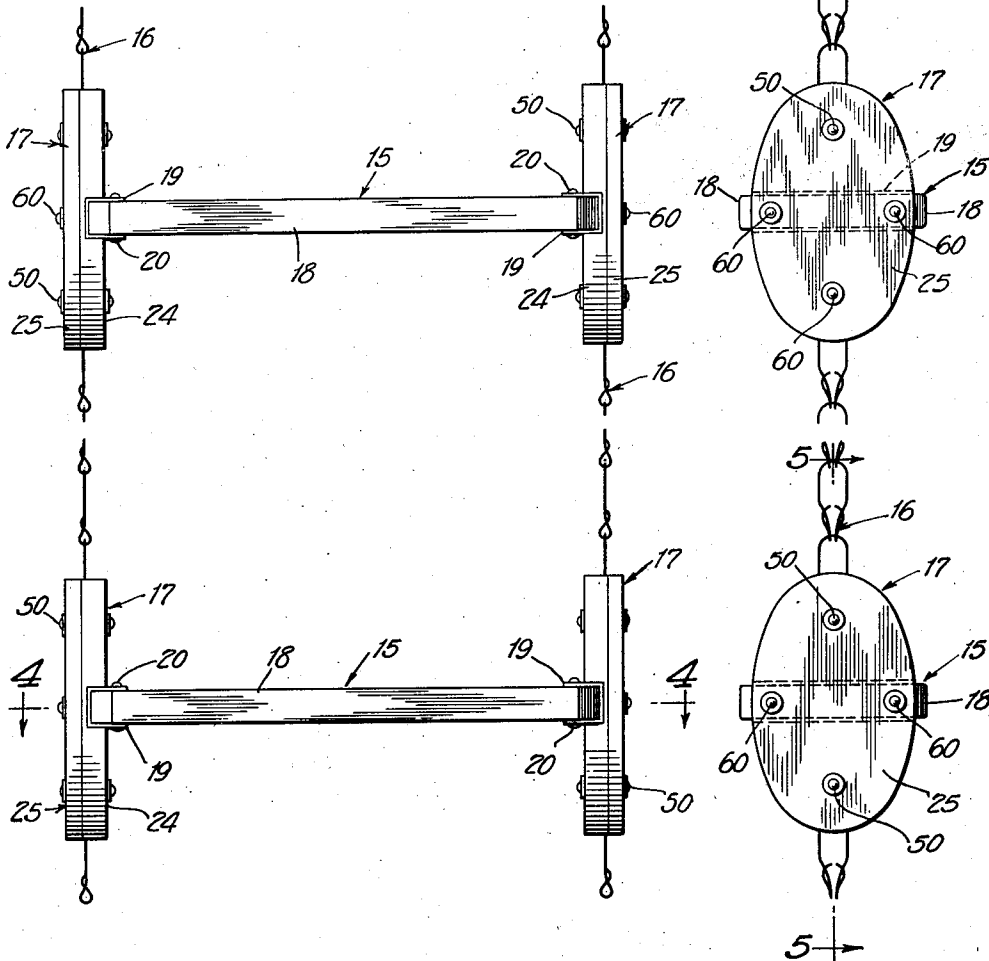
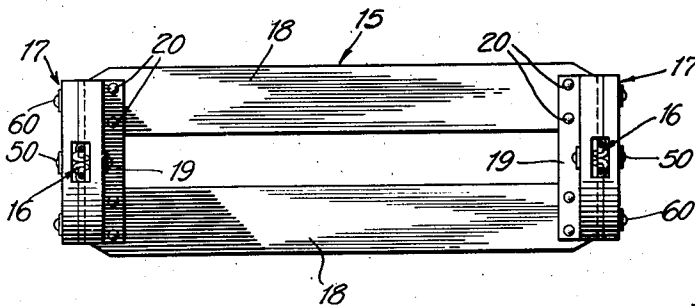


FIG. 3.



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FIG. 4.

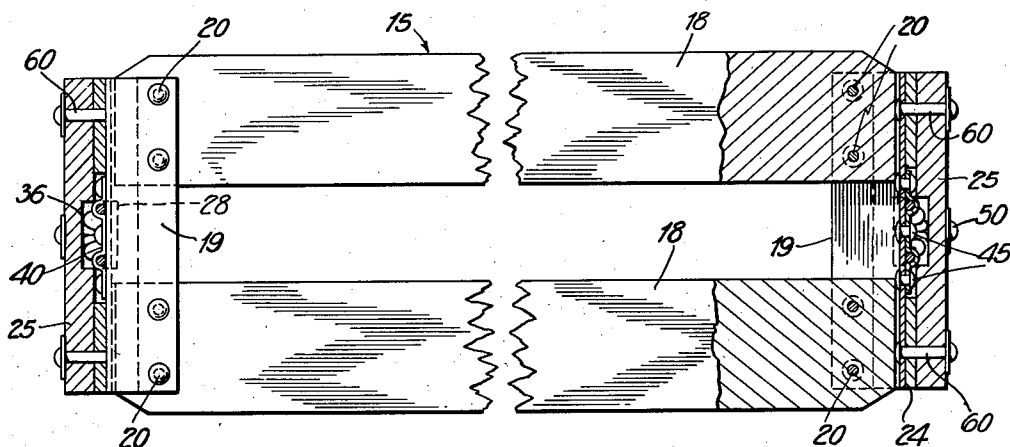


FIG. 5

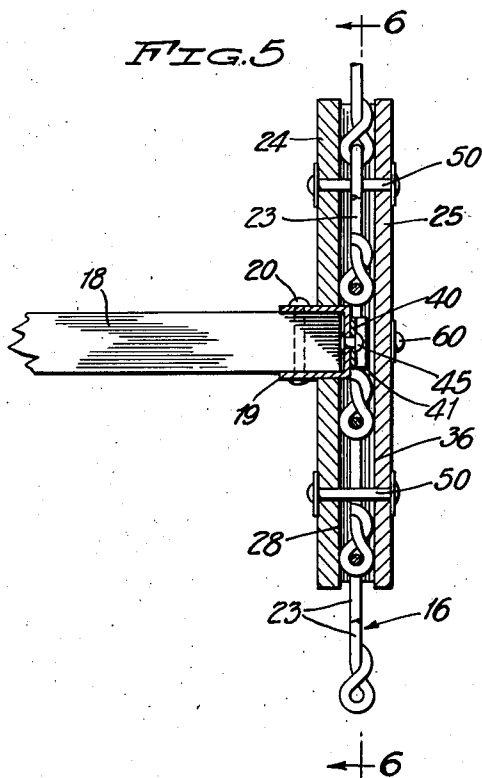
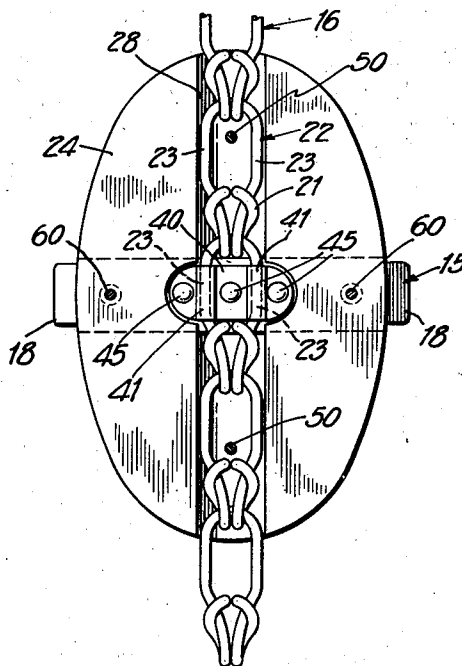


FIG. 6.



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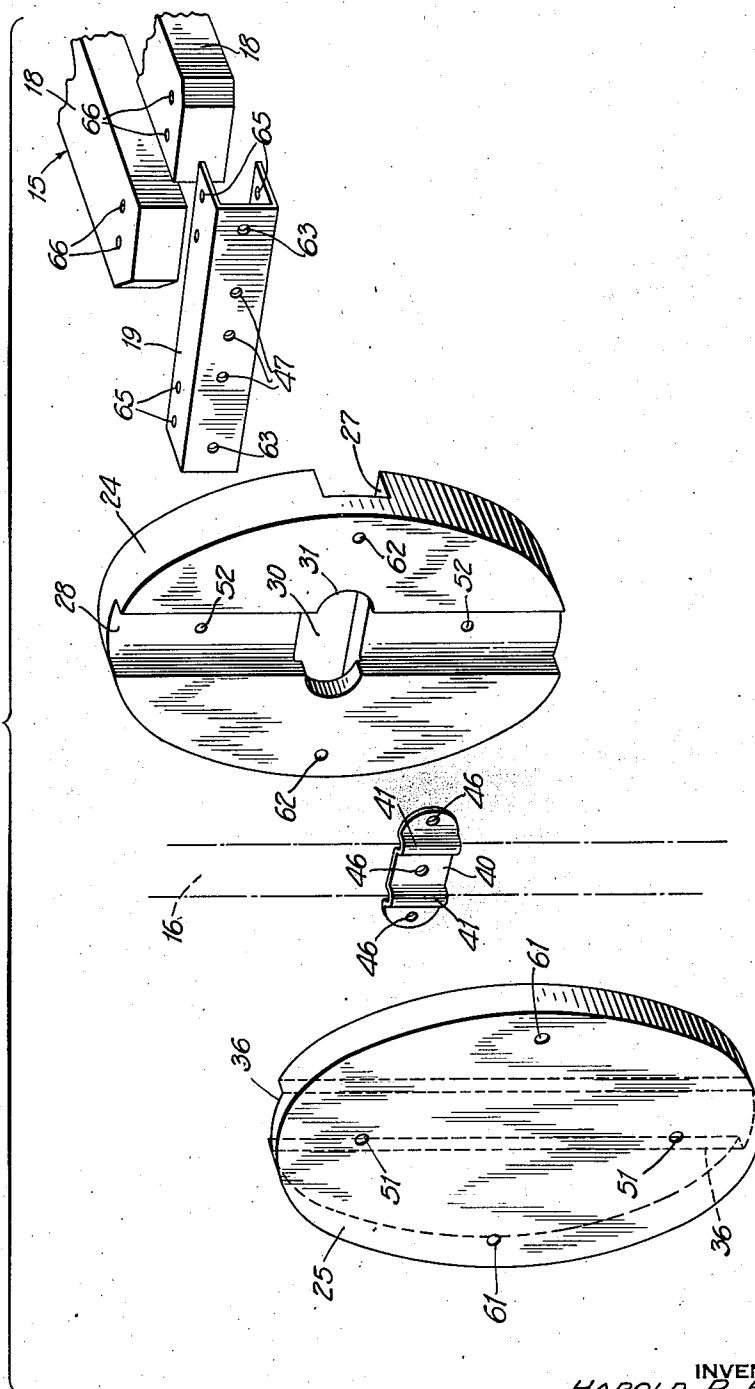
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FIG. 7.



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FIG. 8.

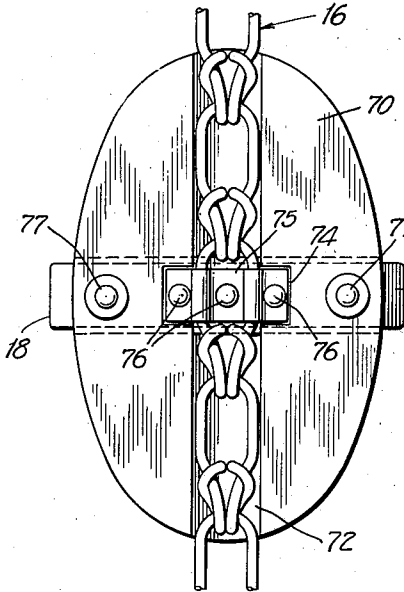


FIG. 9.

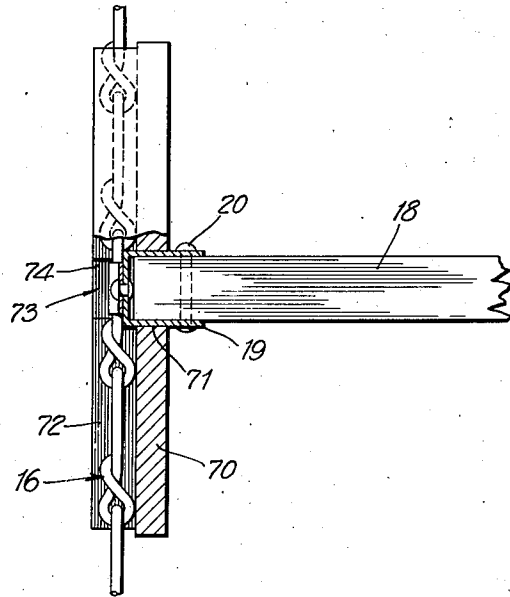


FIG. 10.

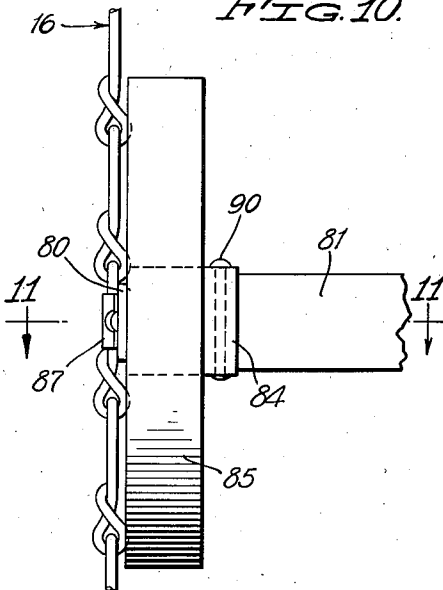
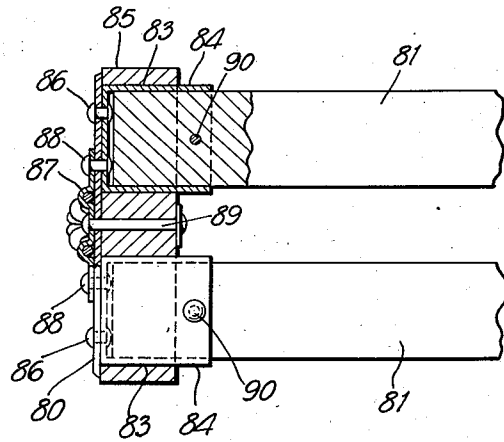


FIG. 11.



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2,353,035

CHAIN LADDER

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Application April 3, 1943, Serial No. 481,663

12 Claims. (Cl. 228—40)

The present invention relates to new and useful improvements in ladders and more particularly it pertains to ladders of the flexible type of which the well known Jacob's ladder is one good example.

Where such ladders are suspended from a ship's side, wall or the like, it is desirable to employ spacing elements to space them from the ship's side or wall to provide hand and foot room for persons using the ladder.

The earlier types of such ladders were constructed from wood and rope, the steps or tread members and spacing elements or ears as they are known in the art, being formed of wood, while the side members or stiles were formed of rope.

More recently, such ladders have been constructed wholly of metal, the stiles being formed of chain.

Such ladders, however, due mainly to the necessities of forming the parts and the assembling thereof, are expensive. They are also heavier than those constructed of wood and they also lack buoyant qualities.

It is the object of the present invention to provide a novel construction whereby flexible ladders of the aforementioned type may be constructed from wood and metal, the steps and spacing ears being formed of wood while the stiles are formed preferably from chain.

A feature of the invention resides in a novel construction of a wood spacing ear which novel construction provides for attachment of such ears to stiles in the form of chains.

Another feature of the invention resides in a novel construction which permits of the formation of steps from a plurality of tread members rigidly secured together in spaced parallel relation.

Still another feature of the invention resides in the employment of a single means for securing the tread members together in spaced relation to form the steps and for securing the steps to the stiles and to the spacing ears.

Other features of the invention relate to certain novel and improved constructions, arrangements, and combination of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawings, illustrating the invention in its preferred forms and the following detailed description of the constructions therein shown.

In the drawings,

Figure 1 is a view in front elevation of a two step section of a ladder constructed in accordance with one form of the present invention,

5 Figure 2 is a view thereof in side elevation,

Figure 3 is a top plan view of one of the steps showing the stiles in section,

10 Figure 4 is an enlarged horizontal sectional view taken longitudinally through one of the steps substantially on the line 4—4 of Figure 1,

Figure 5 is an enlarged vertical sectional view through one of the spacing ears taken substantially on the line 5—5 of Figure 2,

15 Figure 6 is a vertical sectional view through one of the spacing ears taken substantially on the line 6—6 of Figure 5,

Figure 7 is a distended perspective view of the assembly, the chain being illustrated diagrammatically in dot and dash lines,

20 Figure 8 is a view in elevation illustrating a modified form of the invention,

Figure 9 is an edge view partly broken away of that form of the invention illustrated in Figure 8,

25 Figure 10 is a fragmentary view in elevation illustrating a still further modified form of the invention, and,

Figure 11 is a horizontal sectional view taken substantially on the line 11—11 of Figure 10.

30 A ladder constructed in accordance with the present invention comprises steps 15, side members or stiles 16, and spacing ears 17, there being a spacing ear carried by each end of each of the steps 15.

35 In accordance with that form of the invention illustrated in Figures 1 through 7 of the drawings, each of the steps is formed by two tread members 18.

40 These tread members are formed from suitably shaped pieces of wood and they are, in the finished ladder, retained in spaced parallel relation to each other by end members 19 in the form of metal channels, which receive the ends of the tread members 18, the tread members 18 being secured to the end members 19 preferably by rivets

45 20. The stiles 16 are formed by chains, the links 21 of which have a shank portion 22 which consists of two spaced parallel legs 23.

50 The spacing ears 17 are formed of wood and are preferably oval in form and in the final assembly they are secured to their respective stiles with their longitudinal axes in parallelism with the length of the stiles.

Each spacing ear consists of two members, see 55 Figure 7, there being an inner member 24 and

an outer member 25 and in attaching the spacing ears to the stiles, the two members 24 and 25 are secured together in face to face relation with the stile disposed between them.

The inner member 24 of a spacing ear is provided upon its inner face with a transversely extending groove 27 located substantially centrally of the ends of the member and this groove receives the end member 19 of a step 15.

Upon its outer face, the inner member 24 is provided with a longitudinally extending groove 28 for the reception of the stile 16.

The grooves 27 and 28 are of such depth that at their point of intersection, which is substantially at the center of the member 24, an opening 30 results. This opening 30 is suitably enlarged for a purpose to be hereinafter described, by cutting away a portion of the side walls of the groove 28 as at 31.

The outer member 25 of the spacing ear is formed on its inner face with a longitudinally extending groove 36. The groove 36 is so positioned in the member 25 as to coincide with the groove 28 of the member 24 so that together, they form a stile receiving space which extends longitudinally through the spacing ear when the two members 24 and 25 are secured together in face to face relation as heretofore mentioned.

A clip 40 is employed to secure the stile directly to the end member 19 of a step. This clip is formed of metal and it is shaped to provide two spaced parallel transversely extending channels 41 for the reception of the spaced leg members 23 which form the shank portion 22 of a link 21 of the stile 16.

Still referring to Figure 7, the manner in which the complete assembly is accomplished will now be described.

The clip 40, heretofore mentioned, serves to secure the stile 16 directly to the end member 19 of a step and this operation is performed prior to the securing of the tread members 18 of the step, in the following manner.

The end member 19 is placed in the transversely extending groove 27 of the inner member 24 of the spacing ear with its open side disposed outwardly with respect to the inner face of the member 24.

With these parts in this last mentioned position, the central portion of the closed wall of the end member 19 will be available from the outer face of the member 24 through the opening 31 thereof.

The stile is next placed in the longitudinally extending groove 28 in the outer face of the member 24 with the shank portion 22 of one of its links 21 coinciding with the opening 31.

With the parts in this position, the clip 40 is placed in the opening 31 with its channels 41 embracing their respective leg members of the shank portion 22 of the link.

For securing the clip 40 and the stile 16 to the end member 19, three rivets 45 are employed, these rivets passing through openings 46 in the clip 40 and through openings 47 in the end member 19.

The rivets 45 are so spaced that there is one disposed at each end of the clip 40 and upon the outside of its respective leg 23 of the shank portion of the stile link while the third rivet is centrally disposed and passes between the leg members 23 of the shank portion of the stile link.

By the above described construction, it will be apparent that the stile is secured directly to the

end member of the step by a connection which prevents pivotal movement of the step relative to the link of the stile to which the step is secured.

5 The next step in the assembly is to place the outer member 25 of the spacing ear in position in registration with the inner member of the spacing ear and secure together the members of the spacing ear and also to secure the spacing ear to the step.

10 With the two members 24 and 25 of the spacing ear arranged in registration, rivets 50 are passed through openings 51 and 52 respectively in the inner and outer members of the spacing ear and said rivets, when set, serve to secure together in face to face relation, with the stile between them, the two members 24 and 25, to form the complete spacing ear.

15 From the foregoing, it will be apparent that when the two members 24 and 25 are secured together, the member 25 serves to secure the spacing ear to the stile in such a manner as to prevent pivotal movement of both the step and the stile relative to that length of the stile to which they are secured.

20 The rivets 50, heretofore mentioned, are so located in the members 24 and 25 that they pass between the leg members of the shank portion of their respective stile link next adjacent to each end of that stile link which is secured by the clip 40 to the end member 19 of the step.

25 With the parts thus far assembled, the spacing ear is next secured directly to the end member 19 of the step by means of rivets 60. These rivets 60 pass through openings 61 in the outer member 25, openings 62 in the inner member 24, and openings 63 in the end member 19.

30 As thus far described, it will be seen that the end member, the two members of the spacing ear and the stile have been secured together and the assembly is ready for the final step which consists in securing the tread members 18 of the step to the end members 19 thereof.

35 As best illustrated in Figure 5 of the drawings, the side flanges of the end member 19 extend beyond the inner face of the inner member 24 of the spacing ear, a sufficient distance to accommodate the rivets 20, heretofore mentioned.

40 This construction, therefore, readily permits of attachment of the tread members 18 to the end member 19 by means of the rivets 20 which latter pass through openings 65 in the end members 19 and openings 66 in the ends of the tread members 18.

45 From the foregoing it will be apparent that the step is secured directly to the stile, the stile is secured directly to the spacing ear and the spacing ear is secured directly to the step.

50 In the modified form of the invention illustrated in Figures 8 and 9 of the drawings, the spacing ear which is designated 70 in said figures is of oval shape and is formed from a single piece of material.

55 In this form of the invention, the spacing ear is provided upon its inner face with a transversely extending groove 71 for the reception of the end member 19 of the step, it being understood that the step in this form of the invention is of the same construction as in the form heretofore described.

60 Upon its outer face, the ear is provided with a longitudinally extending groove 72 which in itself is of sufficient depth to receive the chain wholly therein.

65 The two grooves 71 and 72 are of such relative

depths at their intersection that an opening 73 which extends entirely through the ear results, and which opening is enlarged upon the outer face of the ear as indicated at 74.

The stile 16 lies within the longitudinally extending groove 72 and is secured directly to the end member 19 by means of a clip 75 and rivets 76 in substantially the same manner as in the afordescribed form of the invention.

In assembling this form of the invention, the stile 16 is laid in the groove 72 of the spacing ear and secured to the end member 19 of the step by the clip 75 and the rivets 76, after which the spacing ear 70 is secured directly to the end member 19 of the step by rivets 77, the tread members 18 being finally secured to the end members 19 by the rivets 20.

In that form of the invention illustrated in Figures 10 and 11 of the drawings, the end member 80 of the step is in the form of a flat strip of metal instead of the channel employed in the other forms of the invention.

The steps in this form are also of different construction in that the tread members 81 may be either round or square in cross sectional form.

The spacing ear 85 is provided with two openings 83 and the ends of the tread members 81 carry enclosing caps 84 which are received in the openings 83 of the spacing ear and which are secured to the end members 80 of the step by rivets 86.

The stile 16 is secured directly to the end member 80 by a clip 87 by means of rivets 88 which also pass through the cap members 84 and a centrally disposed rivet 89 passes through the clip 87, the end member 80 and the spacing ear 85 as illustrated in Figure 11 of the drawings.

In assembling this form of the invention, the caps 84 are first secured to the end member 80 and the end member 80 secured to the stile 16 by the clip 87 after which, the cap members 84 are passed into their respective openings 83 in the spacing ear 85, and the several parts are secured together by the centrally disposed rivet 89.

With the parts thus far assembled, the ends of the tread members 81 are inserted into their respective caps 84 and secured in position therein by rivets 90.

In this form of the invention, the stile 16 is illustrated as lying directly in contact with the outer face of the spacing ear, there preferably being no groove to receive the stile.

It will be noted that in describing each form of the invention the attachment of but one end of a step to a single spacing ear and stile have been described.

It is to be understood, however, that the construction described in each case, is employed at each end of each step.

From the foregoing, it will be apparent that the present invention provides constructions by means of which wooden steps of spaced tread elements and wooden ears may be practically employed in combination with chain side stiles in ladders of the flexible type.

Having thus described the invention, what is claimed as new is:

1. In a ladder of the type described in combination, side stiles in the form of chains, wooden steps in the form of spaced individual tread members, and wooden spacing ears, means for maintaining the tread members in spaced relation, means for securing said tread members spacing means directly to the stiles, and means

for securing the spacing ears directly to the stiles.

2. In a ladder of the type described in combination, side stiles in the form of chains, wooden steps in the form of spaced individual tread members, and wooden spacing ears, means for securing said tread members in spaced relation, means for securing said tread members spacing means directly to the stiles, means for securing the spacing ears directly to the stiles, and means for securing the spacing ears to the tread members spacing means.

3. A ladder of the type described comprising in combination, wooden steps, flexible chain stiles and wooden spacing ears of sufficient thickness to permit of the passage of the chain stiles therethrough, members embracing and rigidly secured to each end of each of the steps, means for securing the step end embracing members to links of their respective chain stiles, means for securing the spacing ears to their respective step end embracing members, and means for securing the spacing ears to their respective stiles.

4. A ladder of the type described comprising in combination, wooden steps, flexible stiles and channeled spacing ears formed of wood, said ears being of sufficient thickness to receive the stiles wholly within the channels thereof, said steps comprising a pair of spaced individual tread members, means for retaining the tread members in spaced parallel relation, means for securing the tread members spacing means to its respective stile, means for securing a spacing ear to the tread members spacing means, and means for securing a stile within the channel of the spacing ear.

5. In a ladder of the type described in combination, side stiles, wooden steps and wooden spacing ears, each of said steps comprising spaced wooden tread members, means embracing the ends of said tread members for securing them together in spaced relation, each of said spacing ears comprising a wooden body portion having a transversely extending groove for the reception of the ends of the tread members and their spacing means and a longitudinally extending passage for the reception of a side stile, means for securing the step member to a side stile, means for securing a spacing ear to a side stile, and means for securing a spacing ear to the step.

6. In a ladder of the type described in combination, side stiles in the form of link chains, wooden steps and wooden spacing ears, each of said steps comprising spaced wooden tread members, means embracing the ends of said tread members for securing them together in spaced relation, each of said spacing ears comprising a wooden body portion having a substantially centrally disposed opening therethrough, and a stile receiving passage intersecting said opening through the body, means positioned in the opening of the ear for embracing one of the links of a side stiles for securing the side stile directly to one end of a step with the stile positioned in the stile receiving passage of the ear, means for securing the ear to the stile, and means for securing the ear to the step end.

7. In a ladder of the type described in combination, side stiles in the form of link chains, wooden steps and wooden spacing ears, each of said spacing ears comprising two members of similar shape adapted to be secured together with a side stile disposed between them, means for securing said members together and to a side stile, means for securing the side stile to a step end,

and means for securing the ear to the step end.

8. In a ladder of the type described in combination, side stiles in the form of link chains, wooden steps and wooden spacing ears, each of said spacing ears comprising two members of similar shape adapted to be secured together in face to face relation with a side stile disposed between them, and each provided with grooves which register to receive a side stile between the members when placed in face to face relation and one of said members having a substantially centrally disposed opening to expose a portion of the side stile within the confines of the spacing ear, means positioned in the central opening of the one member for securing one end of a step to the stile exposed in said opening, means for securing the members together in face to face relation with the side stile disposed in the aforementioned coinciding grooves of the members to secure the spacing ear to a side stile, and means for securing the spacing ear directly to said step end.

9. A wooden spacing ear for chain ladders comprising two similar shaped members adapted to be secured together in face to face relation with a ladder stile disposed between the members, said members having coinciding grooves in their meeting faces which provide a stile receiving space extending through the ear when the members are secured together, a step end receiving groove in the outer face of one of the members, said groove intersecting the stile receiving groove of said member to form a substantially centrally disposed opening within the confines of the member to expose a portion of a ladder stile disposed between the members and to receive attaching means for securing a ladder step directly to the exposed portion of the stile, and means for securing the two members together in face to face relation to form the spacing ear.

10. A wooden spacing ear for chain ladders comprising two similarly shaped members adapted to be secured together in face to face relation with a ladder stile disposed between the members, said members having coinciding grooves in their meeting faces which provide a stile receiving space extending through the ear when the members are secured together, a step end receiving groove in the outer face of one of the members,

said groove intersecting the stile receiving groove of said member to form a substantially centrally disposed opening within the confines of the member to expose a portion of a ladder stile disposed between the members and to receive attaching means for securing a ladder step directly to the exposed portion of the stile, and means for securing the two members together to form the spacing ear and to secure the spacing ear to a ladder stile.

11. A wooden spacing ear for chain ladders comprising two similarly shaped members adapted to be secured together in face to face relation with a ladder stile disposed between the members, said members having coinciding grooves in their meeting faces which provide a stile receiving space extending through the ear when the members are secured together, a step end receiving groove in the outer face of one of the members, said groove intersecting the stile receiving groove of said member to form a substantially centrally disposed opening within the confines of the member to expose a portion of a ladder stile disposed between the members and to receive attaching means for securing a ladder step directly to the exposed portion of the stile, and separate means for securing the spacing ear to a ladder step.

12. A wooden spacing ear for chain ladders comprising two similarly shaped members adapted to be secured together in face to face relation with a ladder stile disposed between the members, said members having coinciding grooves in their meeting faces which provide a stile receiving space extending through the ear when the members are secured together, a step end receiving groove in the outer face of one of the members, said groove intersecting the stile receiving groove of said member to form a substantially centrally disposed opening within the confines of the member to expose a portion of a ladder stile disposed between the members and to receive attaching means for securing a ladder step directly to the exposed portion of the stile, and separate means for securing the spacing ear to a ladder, said last mentioned means also serving to secure the members of the ear together.

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